DOCUMENT RESUME

ED 194 550 TM 800 679

AUTHOR Davis, Robert H.; Alexander, Lawrence T.
TITLE Task Descriptions and Task Analyses: Guides for the Improvement of Instruction in Higher Education--No. 2.
INSTITUTION College of the Mainland, Texas City, Tex.; Michigan State Univ., East Lansing. Learning and Evaluation Service.
PUB DATE 77
NOTE 14p.
AVAILABLE FROM Instructional Media Center, Michigan State University, East Lansing, MI 48824 ($1.00).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Behavioral Objectives; Higher Education; *Instructional Development; *Instructional Improvement; *Task Analysis; *Teaching Methods
IDENTIFIERS *Task Definition; Task Planning; *Task Sequence

ABSTRACT

What task descriptions and task analyses are, how to write task descriptions, and the relationship of task descriptions to instructional objectives are demonstrated in educational settings. A task description is a systematic method of listing the salient features of a task, and identifies the steps or actions that must be taken to perform a task. Instructional objectives are usually derived from task descriptions. All of the elements needed to write instructional objectives are contained in the steps of the task description: action verbs, conditions and constraints, and criteria for evaluating objectives. Task description formats may be either straight narrative, outlines, flow diagrams, tables, or listings. A task analysis is literally an analysis of the task, and any consideration of issues that may affect significantly the design of learning experiences. The complete task analysis is normally used in conjunction with other methods and techniques in designing instruction. (RL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

RECEIVED
AUG 1 1980
ERIC/TM

Task Descriptions and Task Analyses

Guides for the Improvement of Instruction in Higher Education No. 2

ED194550

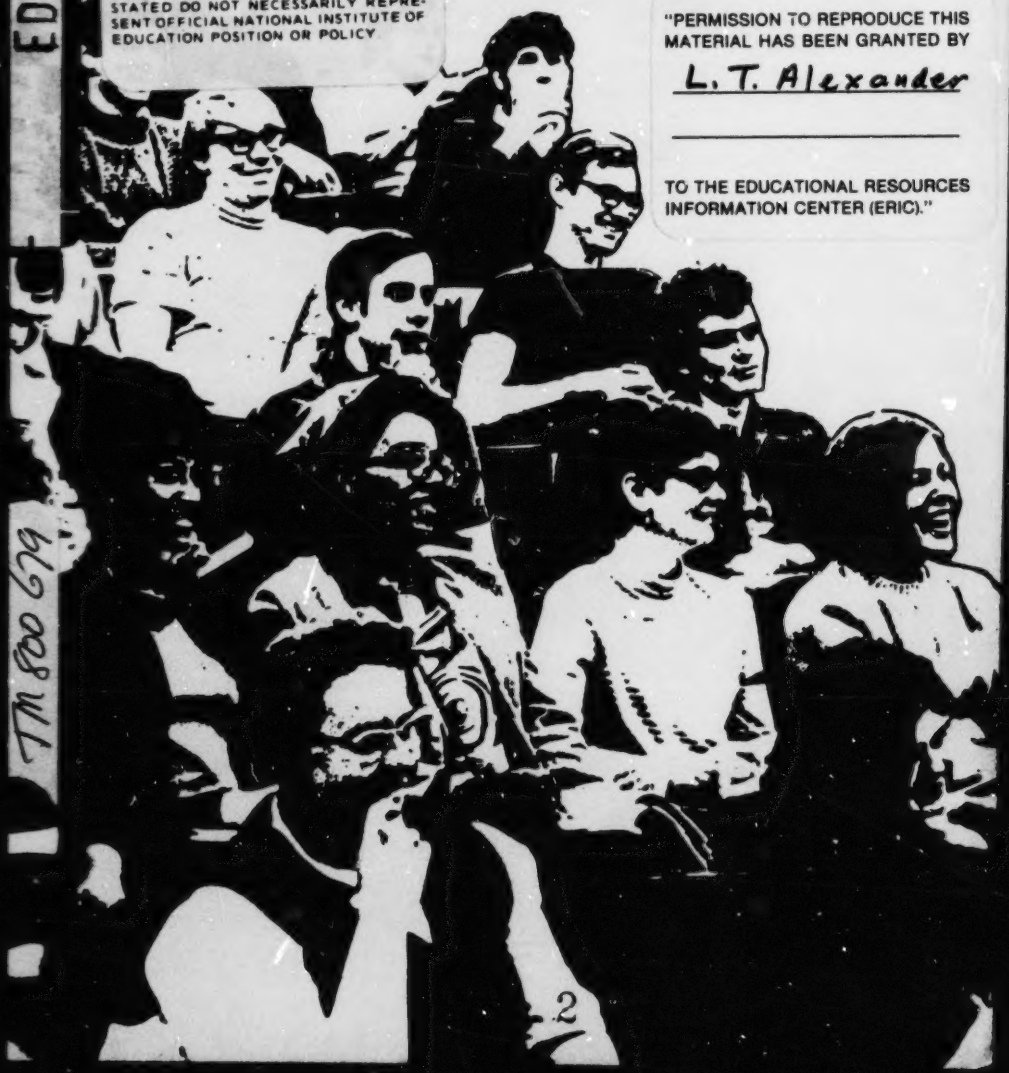
U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Robert H. Davis
Lawrence T. Alexander

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
L. T. Alexander

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."



TM 800 679

Guides for the Improvement of Instruction in Higher Education

This series of guides for the improvement of instruction in higher education is the outcome of a cooperative effort between the Learning and Evaluation Service at Michigan State University and the Educational Development Services, College of the Mainland, Texas City, Texas. Additional copies of this guide or information about the series may be obtained from:

Instructional Media Center
Michigan State University
East Lansing, Michigan 48824

or

Educational Development Services
College of the Mainland
Texas City, Texas 77590

Titles of guides in the series are listed below:

Guide 1	Writing Useful Instructional Objectives
Guide 2	Task Descriptions and Task Analyses
Guide 3	Evaluating Instruction
Guide 4	Effective Use of Media
Guide 5	The Lecture Method
Guide 6	The Discussion Method
Guide 7	Individualized Instruction
Guide 8	Field Experience
Guide 9	The Laboratory
Guide 10	Simulation Techniques
Guide 11	Choosing Instructional Techniques
Guide 12	The Systematic Design of Instruction
Guide 13	Glossary of Terms

Copyright © 1977 by the Board of Trustees
Michigan State University, East Lansing, Michigan 48824
All rights reserved
Printed in the United States of America

Scope of This Unit

Two useful and related techniques for the design of instruction are described in this unit: (1) the task description, and (2) the task analysis. These techniques are not as widely used by teachers as they should be, probably because very few teachers are aware of their potential value.

The Task Description

A task is an action or action sequence directed toward some goal. A *task description* is a systematic method of listing the salient features of the task. Some tasks are physical and public in the sense that they may be seen or otherwise observed, and some tasks are private or purely cognitive, i.e., "done in the head." But whether a task is public or private, physical or cognitive, it consists of a set of actions to reach a goal. Here are some examples of tasks:

— distinguish a Rembrandt from a Renoir
— play a waltz on the piano
— solve an equation with two unknowns
— write a learning objective

These four simple examples of tasks say nothing about how, or how well, the task is to be performed, by whom, and under what circumstances. The examples above are *not* complete task descriptions or task analyses. They are just tasks.

A task description identifies the steps (or actions) that must be taken to perform a task. These actions are always stated in the form of explicit and concrete action verbs such as *explains, asks, lifts, calls, divides,* etc. The person performing a task is always *doing* something, whether it is observable (publicly) or not (privately or cognitively).

Sometimes the task description can be written by a teacher because he or she knows best how the task should be performed. But trainers sometimes need to describe how someone else performs a task because they (the trainers) are not experts. A trainer in industry, for example, might be asked to design a training program for welders. If he does not know how to perform the task, he cannot sit down and write a task description. He will need to determine what welders actually do to accomplish what purposes using what tools and under what circumstances.

The Task Analysis

The task analysis is literally an analysis of the task. Since the task description is nothing more than the steps taken in performing a task, it does not include any consideration of some issues that may affect significantly the design of learning experiences — for example, what tools will be available to help a student perform the task (e.g., a slide-rule, calculator, pencil and paper, shovel, etc.). The steps in a task may be essentially the same whether a calculator is available or not, but the training strategy may be altered significantly by the availability of special tools, work aids, or equipment.

Similarly, we need to ask about circumstances under which a task is to be performed. It is one thing to tie a surgical knot in a piece of plastic for demonstration purposes and quite another thing to tie the same knot on a live patient in the operating room.

We have tried to draw a distinction between a simple *description* of how a task is performed and a complete *analysis* of the task to help you see that two steps are needed. Sometimes both steps are included in the term *task analysis*. Since the task description by itself is seldom adequate for training design, you will probably always need a complete task analysis.

Finally, you should know that in work settings tasks are commonly grouped into *jobs*. Indeed, industrial psychologists and industrial engineers often talk about job analysis as well as task analysis. They mean by job analysis breaking jobs down into concrete tasks and describing and analyzing the tasks. Engineers and psychologists are interested in job analysis for many reasons. Job analysis may be used to (1) help make decisions about the recruitment and selection of workers; (2) classify jobs for a variety of purposes, such as compensation of workers; (3) aid in the redesign of jobs; (4) evaluate worker performance; and (5) design better training programs. In this unit, we will focus primarily on task analysis, not job analysis, and we will be most interested in its application to the design of learning experiences. Task analysis is a valuable tool for the teacher despite the fact that in the classroom and laboratory tasks are seldom, if ever, combined into jobs.

Purpose of This Unit

This unit was designed to teach what task descriptions and task analyses are and how to write them. Many teachers believe that task analyses are useful in industry but have little relevance to education. We hope to demonstrate that a task analysis is valuable in educational settings as well as in industry. The task analysis is closely related to the definition of instructional objectives, and this unit will help you to understand how an instructional objective differs from a task analysis and in what ways objectives and task analyses reinforce one another.

Clarifying Your Goals and Expected Results

A task analysis is normally used in conjunction with other methods and techniques in designing instruction. By itself, the task analysis is one step in the direction of specifying precisely course content, methods of instruction, level of instruction, etc.

If you have one or more problems with your instruction, a task analysis, when used with other techniques, will be helpful to you. Although the task analysis will not answer directly the questions implied in the following statements, it will provide many useful clues to help you arrive at an answer.

1. The lessons I prepare do not seem to be particularly well suited to some students, i.e., the material is too advanced for some of them and not advanced enough for others.
2. I sometimes discover serious omissions and gaps in my instruction, i.e., things I've left out that students need to know.
3. I am not very clear about how best to order the ideas (concepts, principles, or skills) that my students are to learn.
4. I'm not sure how to decide what conditions of training (methods of teaching) to use to help students learn the material I am teaching.

An Example of a Task Description

Assume that you are a student who does not know how to make wine. Your "teacher" describes the process of wine making to you (the student) as follows:

> All you need is some fruit juice, like grape juice, sugar, and some yeast. You put the juice in an open vat and add the sugar and yeast. After a little while the juice will start to ferment. When it stops fermenting, bottle the "wine" and allow it to age.

In a sense, the above paragraph is a task description, but it is far from adequate. Even if you were to follow the procedure described exactly, the "wine" you would produce would not be very good. The description omits a number of steps and glosses over essential concepts and principles.

A more complete description of the steps involved in making wine would include as a minimum the following steps:

1. Put 2 cups white sugar in plastic pail and add one quart of wine grape concentrate.
2. Using concentrate bottle for measure, add 4 full bottles of warm water and stir to dissolve.
3. Add Yeast Nutrient and Acid Blend.
4. Cover pail with plastic sheet and tie down loosely to keep out dust.
5. When mixture has cooled to 70°, sprinkle package of wine yeast on top of liquid.
6. Measure acid level and balance.
7. Fermentation should begin in 8-12 hours and is apparent when bubbles cover the surface of liquid.
8. Wait one day. Check specific gravity.
9. Allow wine to ferment in pail for 5 days until specific gravity equals 1.095.
10. Wash plastic fermentation tank thoroughly; then using plastic hose, syphon wine from pail into fermentation tank.
11. Add enough water to fill the tank up to neck.
12. Screw fermentation lock onto tank.
13. Allow wine to ferment in plastic fermentation tank for three weeks.
14. Syphon wine back into bucket, wash sediment from

fermentation tank, syphon back into tank and again top up with water.

15. Attach fermentation lock again and leave approximately one month or until fermentation is completely finished.
16. Fermentation is finished when no bubbles can be seen around neck of tank.

The wine should now be clear and ready to bottle. If wine is not sweet enough it should be sweetened to taste before bottling.

Although the above task description would certainly be useful to a novice, it is obvious that many concepts and principles will still need to be explained. What, for example, is specific gravity? How do you measure specific gravity? What is acid level? How is it balanced? What is fermentation? What is a fermentation lock? How do you use a fermentation lock?

Indeed, some of the questions raised by the task description suggest the need for additional task descriptions. For example, here is a task description of how to sweeten wine:

1. Syphon wine carefully into plastic pail.
2. Make a sugar syrup of ½ cup sugar dissolved in ¼ cup water.
3. Stir required amount of syrup into wine.
4. Crush and add 3 Stabilizer Tablets. (This will prevent renewed fermentation.)

And here is a third task description of acid testing:

1. Using a plastic syringe, measure 15 cc of wine or juice into the test bottle.
2. Using an eye dropper, add three drops of colour solution to the test bottle.
3. Wash out the syringe and fill with 10 cc of sodium hydroxide. Start adding neutralizing solution to the test bottle, one cc at a time until the "end point" is reached.
4. Each 1 cc of neutralizer required indicates .1% of acid as tartaric. Therefore, if you require 8 cc of neutralizer to reach the end point, the acid content of the juice or wine would be .80%.
5. The important acids in grapes are tartaric, citric, and malic.
6. The "end point," the point at which all the acid has been neutralized, is easily seen in both red and white wines or juices. In white wine or juice, the colour changes to pale pink. In red wine or juice the colour changes to grey.

7. Make sure that the bottles are kept well stoppered when not in use because both solutions will deteriorate by exposure to air. Wash syringes and bottles after use.
8. To increase the acid of a wine, a mixture of these three acids (available as Acid Blend) will give the best results.
   1 oz. Acid Blend to 6 U.S. gals of must raises acid .15%.
   1 oz. Acid Blend to 1 U.S. gal of must raises acid .85%.
   4 oz. Acid Blend to 36 U.S. gals of must raises acid .1%.
   To lower the acid content add water or blend with low-acid fruit or grape. The addition of chalk is not recommended.

Notice how the original task description has expanded into three descriptions. Also study the first description and see if you can:

1. Identify the action verb in step five.
2. Identify the cues that are used to tell the student when to move to step six.
3. Specify the resources and special equipment needed to perform step five.*

Uses of the Task Description

The task description helps you plan your lesson. If it is well done, a task description:

1. Identifies concepts and principles that need to be taught
2. Isolates subtasks that need to be described separately and taught
3. Helps to ensure that instruction will be relevant and complete
4. Provides clear-cut indications of the kinds of practice to give students, including resources needed
5. Helps overcome the tendency of teacher-experts to overlook or gloss over critical steps in performing a task

The task description is useful for the presentation of information and demonstration of a task.

The task description is also a valuable checklist for students; it helps to refresh their memories and provides a convenient step-by-step aid to ensure that practice occurs with a minimum number of errors and low level of frustration.

---

* (1) "Sprinkle." (2) When the mixture has evolved to 70°. (3) Thermometer and yeast.

Steps in Writing a Task Description

Identify the Task

When the average instructor is asked to describe what tasks he teaches his students to perform, he often begins by denying that he teaches his students to perform any *tasks* at all. Teachers commonly prefer to describe their function in terms of the transmission of ideas, concepts, or principles to students, not tasks. But, if pressed, most teachers recognize that a large part of what they teach could be thought of as tasks. Consider, for example, the following list of activities or topics that instructors sometimes teach to students:

1. Experimental design
2. Literary criticism
3. Creative writing
4. Personality testing
5. Counseling and guidance
6. Statistical tests
7. Soil analysis

These activities are too complex to be considered tasks. They are really made up of a series of tasks directed toward some objective such as, for example, the design of experiments to test specific hypotheses in agriculture or the behavioral sciences. These broad general activities must be broken down into specific tasks that can be objectively defined.

Information for the task description may be gathered in a wide variety of ways. Most instructors who are familiar with the task are tempted just to sit down and list the steps. A common problem with this approach is the tendency to skip over and condense essential steps. Familiarity can turn a complex task into an apparently simple one and may lead the teacher to misjudge student difficulties and overlook critical steps. As an example, ask, What will my students be able to do after they have learned how to _____ (e.g., design an experiment, administer a test, write creatively, etc.)? The teacher must ask precisely what it means, for example, to be able to design an experiment or write creatively. Tasks are always identified by action verbs, such as *calculate, assign, recognize, spell,* or *graph*. The basic problem is to reduce a general activity

into series of action verbs (or tasks) that constitute appropriate objectives for a course of instruction.

The first criterion, then, for specifying tasks within activities is to focus on action verbs. The second criterion concerns the scope of the task. The task must be circumscribed enough so that it can be taught in the time set aside for it. It is not possible to teach the design of experiments as it is usually taught in one hour. A student may be able to learn how to randomly assign subjects to groups or compute a standard deviation in one hour, but he/she cannot learn to design experiments in that length of time.

Determine How the Task is Performed

Tasks normally are divided into steps. A task description specifies what these steps are. Actually, the task description includes more information than just the steps, but the steps in the task are the core of the task description. Here are five types of information included in the task description.

1. *The student performs what steps?* The steps are stated in the form of explicit action verbs.
2. *In what sequence?* The order of the steps is frequently (but not always) critical.
3. *In order to achieve what immediate outcomes?* How will the student know that he/she has performed each step correctly? What feedback will be available to him/her?
4. *Using what resources?* What aids, tools, or special resources will be available to the student as he/she performs the task, e.g., calculator, tables, graphs, or instruments?
5. *Following what (and whose) instructions?* Precisely what will be the student's instructions? Will he/she have any latitude in following those instructions or must he/she follow them to the letter?

The best way to identify the steps in a task is to use one or more of the following approaches:

1. *Use a previously developed and tested description.* Textbooks frequently contain task descriptions that have proved to be successful.
2. *Interview a colleague who is an expert or ask a colleague to interview you if you are an expert.*
3. *Discuss the task with a group of colleagues who can perform the task.*
4. *Observe and interview an expert as he/she performs the task.*

The basic idea behind all of these techniques is (1) to identify and list *every* step in the task, (2) to examine the sequencing of steps and their importance, (3) to determine what enroute feedback at each step will be available to the student, and (4) to specify what instructions and resources will be made available to the student.

Write the Task Description

Writing down the task description is relatively straight forward. Any one of several different formats may be used, as long as you include the essential elements listed under "Determine How the Task is Performed" (above). The following formats are all acceptable:

1. *Straight narrative descriptions.* For complex tasks, the straight narrative description becomes a little awkward but it is perfectly satisfactory for simple tasks.
2. *Outlines of the task.*
3. *Flow diagrams of the task.*
4. *Tables listing steps in the task, feedback, signals, etc.*
5. *Listings.* Listings normally are used for tasks that are not necessarily sequential. Sometimes the list may be nothing more than the criteria for making a decision or judging among alternatives.

Evaluate the Description

1. Are there any gaps or omissions in the description?
2. Are the steps unambiguously stated in terms of action verbs?
3. Does the description include not only the steps but some indication of the cues that signal when a step is to be taken and criteria for evaluating the adequacy of a step?
4. Given the task description as a checklist, can the task actually be performed by one who is not familiar with it?

Analyzing the Task

After completing the task description, you should inspect it and ask the following kinds of questions:

1. What kinds of skills and abilities must a student bring to the classroom if he/she is to perform this task?
2. What does a student need to know to perform this task? What concepts and principles have I assumed he/she knows?

3. Will this task have to be performed under special conditions outside of the classroom and what are the implications for training?
4. What resources are available to teach this task and what constraints will influence the final design of the classroom experience? Resources include available faculty, space, supplies, teaching assistants, etc. In some cases, constraints are restrictions on such resources as space or supplies, but constraints may also include time available to teach the task.

Relationship between Objectives and the Task Description

Instructional objectives are normally derived from task descriptions. All of the elements needed to write instructional objectives are contained in the steps of the task description: action verbs, conditions and constraints, and criteria for evaluating objectives. Sometimes a teacher discovers while writing an objective (or step in a task) that the step is too large and that it must be treated as a subtask. Thus, as you proceed through a task description writing your objectives, you may discover subtasks that will have to be broken down into additional instructional objectives.

Bibliography

Alluisi, E. A. Methodology in the use of synthetic tasks to assess complex performance. *Human Factors*, August 1967, 9(4): 374-84.

Annett, J., and Duncan, K. D. *Task analysis and training design*, ERIC 019566, 1967 (mimeo).

Armsby, D. H. Task-demands analysis. *Human Factors*, December 1962, 4(6): 381-87.

Fine, S. A. *Functional job analysis: How to standardize task statements*. Kalamazoo, Mich.: W. E. Upjohn Institute, 1974.

Fine, S. A., and Wiley, W. W. *An introduction to functional job analysis: A scaling of selected tasks from the social welfare field*. Kalamazoo, Mich.: W. E. Upjohn Institute, 1971.

Miller, R. B. Task description and analysis. In R. M. Gagné (ed.), *Psychological principles in system development*. New York: Holt, Rinhart and Winston, 1963, 187-228.

Miller, R. B. Task taxonomy: Science or technology? *Ergonomics*, 1967, 10(2): 167-76.